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Public Works (1898) Department.

Print urgently

G.O., No. 584 / 585

DATED 29 July 98

30-நாட்கள்

[Despatch Abstract.]

Periyar Project. Directing that the estimates submitted by the Chief Engineer for Irrigation for lowering the bed of the Periyar Escape Channel & the parapet of the Main Dam, be forwarded for the consideration & orders of the Govt of India.

=

Periyar Project: Forwarding for the consideration & orders of the Govt of India estimates for lowering the bed of the Periyar Escape Channel & the parapet of the main Dam, with notes thereon by the Chief Engineer for Irrigation.

Indexed.

P. W. M.

G.O.	No.	Department.	Date.	G.O.	No.	De

தமிழ்நாடு ஆவணக்காப்பகம்
பாதுகாப்பு பிரிவு

செப்பனிட்டவரின் பெயர் : டி. பிரகாசம்
செப்பனிடுவதற்கு 9/13
எடுத்துக்கொண்ட நாள் : 9/2013
செப்பனிட்டு முடித்த நாள் : — 1/14

28/1/14 - சரிபார்க்கப்பட்டது - 4/3/14 21/2/14

முநிபாஎ(1) முநிபாஎ(2) ஆராய்ச்சி உதவியாளர்

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IRRIGATION.

Government (1898) of Madras.

PUBLIC WORKS.

Recd.	1898.	*Enclosures*	
Regd.		*Spare copies*	

G.O., Nos. 584, 585 I., 29th July 1898.

JULY.

Periyar Project

Forwarding, for the consideration and orders of the Government of India, estimates for lowering the bed of the Periyár escape channel and the parapet of the main dam, with note thereon by the Chief Engineer for Irrigation.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

Read—the following papers:—

From the Chief Engineer, Public Works Department, Bombay, to the Chief Engineer for Irrigation, Madras, dated Bombay Castle, 20th January 1898, No. C.E. 5.

I have the honour to acknowledge receipt of your letter, dated the 27th August 1897, and, in compliance with the request therein made, to forward copies of letters from local officers furnishing the requisite information in connection with the Lake Fife, Bhatghar Reservoir and Tansa Lake, together with a tracing* showing the catchment and gauge stations of the two former lakes. I also enclose a copy of Notes on Floods in some of the rivers in the Nasik district supplied by the Executive Engineer of that district, which may afford useful data. The remaining two works, viz., Maladevi and Newri tanks, mentioned in the margin of paragraph 2 of your letter under reply, have not yet been constructed.

* To be returned please.

Enclosures.

From the Executive Engineer, Bombay, to the Municipal Commissioner, Bombay, dated 15th October 1897, No. 9686 of 1897–98.

I have the honour to report that hourly observations of the rainfall are not made at Tansa, but only twelve-hourly and daily rainfalls are registered.

2. I beg to submit a statement showing the heaviest rainfall at Tansa during the last four years.

3. The Tansa catchment area measures nearly 52 square miles and is surrounded by ranges of high hills both on the north and south gradually sloping towards the east.

4. The masonry dam built across the valley to a length of over 9,000 feet, almost faces the direction of the storm.

5. The hills are thickly covered with teak, dhavra and other trees which form the Tansa forest.

6. Rice and nachni are cultivated over a limited portion of the high ground, but grass grows over a large tract of the land.

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Date and month.	Time of taking observations.	12 hour's rainfall.	24 hour's rainfall.	Remarks.
12th July 1894	6 P.M. 6 A.M.	1·95 3·86	5·81	
19th July 1894	6 A.M. 6 P.M.	1·07 6·25	7·32	24·54 inches in three continuous days.
20th July 1894	6 P.M. 6 A.M.	5·63 3·93	9·56	
21st July 1894	6 P.M. 6 A.M.	3·73 3·93	7·66	
20th June 1895	6 P.M. 6 A.M.	4·14 1·20	5·34	
17th July 1895	6 P.M. 6 A.M.	2·90 1·25	4·15	
7th August 1895	6 P.M. 6 A.M.	3·79 ·55	4·34	
7th September 1895	6 P.M. 6 A.M.	1·50 2·62	4·12	
21st June 1896	6 P.M. 6 A.M.	1·62 3·50	5·12	
22nd June 1896	6 P.M. 6 A.M.	2·80 1·40	4·20	
24th July 1896	6 P.M. 6 A.M.	3·40 4·71	8·11	
25th July 1896	6 P.M. 6 A.M.	3·54 1·84	5·38	
28th July 1896	6 P.M. 6 A.M.	·40 6·20	6·60	20·65 inches rainfall in three days.
29th July 1896	6 P.M. 6 A.M.	4·45 3·85	8·30	
30th July 1896	6 P.M. 6 A.M.	·75 5	5·75	
10th August 1896	6 P.M. 6 A.M.	2·70 2·45	5·15	
15th July 1897	6 P.M. 6 A.M.	3·30 1·80	5·10	
7th August 1897	6 P.M. 6 A.M.	5·15 2·80	7·95	
8th August 1897	6 P.M. 6 A.M.	2·25 2	4·25	

No. 18034.

Copy forwarded with compliments to the Secretary to Government, Public Works Department, with reference to his No. 726 I. of 16th September last.

16th October 1897.

(Signed) J. H. DuBOULAY,
Dy. Munl. Commr. for the City of Bombay.

From the Executive Engineer for Irrigation, Poona District, to the Superintending Engineer, C. Division, dated Poona, 12th October 1897, No. 5323.

With reference to G.M. 725 I., dated 16th ultimo, forwarded under your No. 6965, dated 21st idem, I have the honour to report as follows:—

Lake Fife.

(1) Catchment area, 196 square miles.
(2) Estimated rainfall—information not available.
(3) Estimated discharging capacity of the W. weir, 62,000 cubic feet per second.
(4) Average rainfall at Kharakwasla for the last 20 years, 31·21 inches.
(5) Maximum observed rainfall in 24 hours, 4·34 inches.
(6) Maximum observed flood, 106,083 cubic feet per second.
(7) Maximum run off in any 24 hours—information not available.

With regard to (4) I would, however, point out that the figures given are those taken from the gauge at Kharakwasla, which is at the dam end of the lake. Figures of rainfall during the two years 1878 and 1879 at eight places in the catchment area are available. These two years were, at Kharakwasla, years of slightly over the average fall. The figures are as below:—

	Average.	Maximum.
Athkarwadi	49·69	2·72
Singhur Hill	57·47	2·94
Ambegaon	84·67	4·50
Musa	108·53	6·85
Yejra	217·29	8·60
Dupsura	145·10	8·15
Mutha	58·14	3·68
Bamboa	37·39	3·45
	8)758·28	
	94·78	

It is this rainfall that is instrumental in filling the lake and not that gauged at Kharakwasla.

The maximum gauged at Kharakwasla itself occurred during a storm in November while the greatest floods have occurred in July.

A run off of 7 per hour from the whole catchment gives a flood of 126,585 cubic feet per second. So that the maximum observed flood is equal to a run off of 0·84 inch per hour, while the estimated run off is practically ½ inch per hour. The intensity of this flood, which is great, is due to the nearness of the lake to the Western Ghauts, the catchment running out to the water-shed.

The basin of the lake is entirely surrounded by high hills partly covered with jungle and includes only a small area of cultivated ground. The sides of the hill are steep. The basin runs nearly due east and west, the dam being at the eastern end. The lake is fed almost entirely from the south-west monsoon rains.

Information regarding Bhatghar reservoir has been asked for from Mr. Morres, Assistant Engineer, and will be forwarded on receipt.

From the Executive Enginee rfor Irrigation, Poona District, to the Superintending Engineer, Central Division, Poona, dated Wadgaon, 6th December 1897, No. 6246.

In continuation of this office No. 5323, dated 12th October 1897, I have the honour to forward the following information regarding Bhatghar tank :—

(1) Catchment area—128 square miles.

(2) Estimated rainfall—145 inches, being the mean between 40 inches at Bhatghar and 250 inches on the Ghauts.

(3) The average and maximum rainfalls of the various reporting stations is as below :—

		Average.	Maximum, 24 hours.
Bhatghar bungalow	(15 years)	43·44	4·25
Do. village	(17 „)	44·62	3·65
Pasora	(1 year)	56·40	No record.
Rajghar	(1 „)	46·48	5·75
Mala	(1 „)	105·36	7·20
Bopa	(1 „)	203·93	7·80
Torna	(1 „)	134·84	5·65

A tracing showing observing stations is attached.

(4) Maximum observed flood occurred on 30th July 1896. All lower sluices, 15 in number each 8′ × 4′, were open. The water level reached 64·50 feet in the lake. The flood was at the rate of 25,500 cubic feet per second. This is at the rate of 3,096 inches per hour.

(5) There is no record of the maximum quantity run off in 24 hours.

(6) The basin of the lake is entirely surrounded by high hills partly covered with jungle and includes only a small area of cultivated ground. The sides of the hill are steep. The basin runs nearly east and west, the dam being at the eastern end. The lake is fed almost entirely from the south-west monsoon rain.

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Notes of Flood in Bombay Presidency.

Two floods.—The following are records of large floods in Khandesh, Bombay Presidency. The upper Panjra river has at the site of the Datarti weir a catchment of 265 sq. miles. Its average width is 8 miles on the north, south and west; it is bounded by trap hills with steep uncultivated slopes, the valley between being flat and cultivated. The rainfall gauged was—

Date.	Rain-gauge stations.				
	Amti.	Dahiwad.	Pimpalner.	Sakri.	Lakhala.
7th September 1882	..	2·03	0·12	0·29	} 1·35
8th " "	9·71	0·29	0·00	0·00	
9th " "	..	1·31	1·92	1·54	} 2·30
10th " "	..	4·03	4·02	2·67	
11th " "	} ..	4·31	4·11	3·33	..
12th " "	} 5·31	..	..	..	2·30
13th " "					
	15·02	11·97	10·17	7·83	5·95

At the stations where two or more days' falls are bracketed, daily observations were not made.

The flood as calculated from the high flood marks amounted to 49,700 cubic feet per second or to a run off of 0·299 inch per hour. During the same time the neighbouring Burai river at Ranniálá with a catchment of 65 square miles, which is practically uncultivated and is elevated with hills on the north, south and west had a flood similarly calculated, of 37,800 cubic feet per second equal to a run off of 0·90 inch per hour. There were no rain-gauge stations in this area. At the Jamda weir Girna river on September 15th, 1872, the flood rose to 16·45 feet on the weir crest and was calculated to amount to 473,000 cubic feet per second. The catchment area is about 2,050 square miles, extending from the Ghauts, where it is 30 miles wide, hilly and uncultivated, to the weir site where it is flat and cultivated.

This gives a run off of 0·28 inch per hour. At the same place on 11th September 1882 there was another severe flood rising to 15·90 feet on the weir crest, but, as it outplanked the work and broke into a tributary valley damaging the canal, and could not be gauged at the weir site, it was probably as large as the previous one. The rainfall gauged on this latter occasion on September 9th, 10th and 11th was—

Station.	Ghauts.		Upper basin.		Lower basin.			
	Hatgad.	Aliabad.	Chankapur.	Kalvan.	Nandgaon.	Malegaon.	Saigaon.	Jamda.
Miles above weir	97	82	81	71	34	16	38	2
Inches of rainfall	22·80	56·59	12·21	14·42	8·15	5·83	9·35	3·35

At Mahilla near Dhulia the Panjra river on the 15th September 1872 had a flood discharge of 276,000 cubic feet per second, equal to a run off of 0·54 inch per hour on a catchment of 788 square miles. The river rises in the Western Ghauts; at its source the catchment has its maximum width of 21 miles, is elevated and bounded by steep uncultivated hills. Uncultivated trap hills bound the whole valley but lower down it is itself flat and cultivated. The rainfall gauged was—

—	Distance from gauge station.	September.					Total.
		11	12	13	14	15	
Penipalner	45 miles ..	2·13	0·20	..	9·90	0·60	12·83
Dhulia	1 mile ..	..	0·34	..	5·69	0·36	6·39

The flood commenced to rise at 8 P.M. on the 14th, obtained its maximum at 6–30 A.M. on the 15th and returned to its original dimension on the morning of the 16th.

(Signed) W. L. STRANGE,
Ex. Engr., Nasik District.

From the Superintending Engineer, C. Division, to the Secretary to Government, Public Works Department, Bombay, dated Nandgaon, 22nd December 1897, No. 128/D.

Memorandum.

With reference to Government Memo. No. 725 I., dated 16th September last, forwarding copy of a letter from the Chief Engineer for Irrigation, Ootacamund, has the honour to forward copies of No. 5323, dated 12th October last and No. 6246, dated 6th instant from the Executive Engineer for Irrigation, Poona, giving the information asked for, for Lake Fife and Bhatghar tank, respectively, also copy of *notes* on floods in some of the rivers in the Nasik district supplied by the Executive Engineer which may be found of interest; a tracing also accompanies, showing the catchment and gauge stations of Lake Fife and Bhatghar tank.

From the Chief Engineer, Public Works Department, Bombay, to the Chief Engineer for Irrigation, Madras, dated Mahabaleshwar, 26th May 1898, No. 27 C.E.

I have the honour to acknowledge receipt of your letter, No. 49 M., dated 10th February 1898, and, in compliance with the request therein made, to forward copy of a letter from the Executive Engineer for Irrigation, Poona district, furnishing the additional information required in connection with the Lake Fife and Bhatghar Reservoir.

ENCLOSURE.

From the Executive Engineer for Irrigation, Poona District, to the Superintending Engineer, Central Division, Poona, dated 6th May 1898, No. 2200.

With reference to your No. 1127 of 28th ultimo forwarding Government memo. No. 118 I. of 22nd idem, I have the honour to report as follows:—

Lake Fife.

Date.	Time.	R.L. of water.	Area.	Contents.
July 29th	8 P.M. ..	249·67	164,816,876	90,836,690
" "	9 " ..	250·22	165,498,359	
" "	9–30 P.M. ..	250·57	165,932,030	58,000,301

Waste weir clear overfall. { Length, 513 feet ... ... R.L. 243·07
" 716 " ... ... " 244·07

PERIOD FROM 8 TO 9 P.M.

Discharge over waste weir at 8 p.m.

Lower $= 3{\cdot}488 \times 513 \times 6{\cdot}6\sqrt{6{\cdot}6} = 30{,}351$ cubic feet per second.
Higher $= 3{\cdot}488 \times 716 \times 5{\cdot}6\sqrt{5{\cdot}6} = 30{,}593$ " "

Total discharge at 8 P.M. = 60,944 " "

Discharge at 9 p.m.

Lower $= 3{\cdot}488 \times 513 \times 7{\cdot}15\sqrt{7{\cdot}15} = 34{,}159$ cubic feet per second.
Higher $= 3{\cdot}488 \times 716 \times 6{\cdot}15\sqrt{6{\cdot}15} = 38{,}090$ " "

Total discharge at 9 P.M. = 72,249 " "

Mean discharge during hour $\frac{60{,}944 + 72{,}249}{2} = 66{,}596$ cubic feet per second.

Replenishment in tank $= \frac{90{,}836{,}690}{3{,}600}$ cubic feet $= 25{,}232$ " "

Flood = 91,828 " "
Discharge over weir at 9 P.M. = 72,249 " "

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PERIOD FROM 9 P.M. TO 9–30 P.M.

Discharge at 9–30 p.m.

Lower = $3{\cdot}488 \times 513 \times 7{\cdot}5\sqrt{7{\cdot}5}$ = 36,771 cubic feet per second.

Higher = $3{\cdot}488 \times 716 \times 6{\cdot}5\sqrt{6{\cdot}5}$ = 41,394 " "

Total discharge at 9–30 P.M. = 78,165

Mean of period $\frac{72{,}249 + 78{,}165}{2}$ = 75,207 " "

Replenishment in tank = $\frac{58{,}000{,}301}{1{,}800}$ = 32,222 " "

Total flood ... 107,429 " "

I should however state that the actual time at which the highest flood occurred is not exactly known. The float of the automatic gauge was washed away soon after 9 o'clock and the exact level of the water at that time is difficult to ascertain as the line traced is very erratic, but it is approximately what I have stated. In the original report on the flood the time at which the maximum height was reached is stated to have been 9–30 P.M. and the maximum height itself was ascertained the following morning to have been 250·57. The automatic gauge shows that the intensity of the flood was less during other hours of the day.

The gaugings of the lake and area are as follows:—

Date.	Time.	R. L.	Area.
July 28th	9 P.M. ..	47·14	161,682,047
" "	10 " ..	47·57	162,214,845
" "	11 " ..	48·07	162,834,376
" "	12 " ..	48·60	163,491,097
" 29th	1 A.M. ..	48·97	163,949,593
" "	4 " ..	49·18	164,209,736
" "	5 " ..	49·57	164,692,971
" "	6 " ..	49·87	165,064,689
" "	7 " ..	50·07	165,312,500
" "	8–20 A.M. ..	50·07	165,312,500
" "	9 A.M. ..	49·87	165,064,689
" "	10 " ..	49·60	164,730,142
" "	10 " ..	49·60	164,730,142
" "	11 " ..	49·25	164,296,170
" "	12 noon ..	48·92	163,887,590
" "	1 P.M. ..	48·67	163,577,814
" "	2 " ..	48·55	163,429,106
" "	3 " ..	48·54	163,416,797
" "	4 " ..	48·62	163,515,861
" "	5 " ..	48·77	163,701,730
" "	6 " ..	48·99	163,974,314
" "	7 " ..	49·29	164,346,033
" "	8 " ..	49·67	164,816,876
" "	9 " ..	50·17	165,436,406
" "	9–30 P.M. ..	50·57 (probable)	165,932,030
	Gauge displaced.		
July 30th	12 noon ..	48·03	162,784,818
" "	1 P.M. ..	47·76	162,450,266

2. With regard to the flood in Bhatghar lake it is not possible to go into the same detail owing to the less number of gaugings taken. The actual gaugings of the tank show the following :—

Date.	Time.	R. L.	Contents, millions cubic feet.	Increase in contents during period, millions cubic feet.	Length of period.	Increase in tank per second.
					HOURS.	
July 28th	6 P.M.	46·8	687·2	569·6	24	6,590
" 29th	6 "	54·5	1,256·8	702·3	24	8,130
" 30th	6 "	61·6	1,959·1	128·7	24	1,490
" 31st	6 "	62·8	2,087·8	245·8	12	5,690
August 1st	6 A.M.	64·5	2,333·6	..	..	..

During these periods the whole of the undersluices each 8′ × 4′ were open. The discharge on 30th when the level stood at 61·6 would be—

$$D = AV \qquad V = C\sqrt{2g\,h} \qquad C = 0{\cdot}65$$

$$D = 15 \times 8 \times 4 \times 0{\cdot}65 \qquad \sqrt{64{\cdot}4 \times (61 - 3{\cdot}4)}$$

$$= 312\sqrt{64{\cdot}4 \times 57{\cdot}6} = 312\sqrt{3{,}709{\cdot}4}$$

$$= 312 \times 60{\cdot}9 = 19{,}000 \text{ cubic feet per second.}$$

Add the average increase in tank during the period, the total becomes 19,000 + 8,130 = 27,130 cubic feet per second representing a run-off of 0·33 inches per hour from the catchment of 128 square miles. The discharge on 1st when the level stood at 64·5 would be—

$$D = 312\sqrt{64{\cdot}4 \times (64{\cdot}5 - 4)} = 312\sqrt{64{\cdot}4 \times 60{\cdot}5}$$

$$= 312\sqrt{3{,}896{\cdot}2} = 312 \times 62{\cdot}4 = 19{,}469 \text{ cubic feet per second.}$$

Add the average increase in tank during the period, the total becomes 19,469 + 5,690 = 25,159 cubic feet per second or a run-off of 0·30 inch per hour from the catchment of 128 square miles.

No. 193 I.

Note by the Chief Engineer for Irrigation.

The estimates called for in the Government of India letter No. 325 I., dated 2[illegible] December 1897, for removing part of the parapet of the Periyár main dam and for lowering the level of the escape are herewith submitted. Since the note printed with G.O., No. 992 I., dated 10th November 1897, was written, the Chief Engineer, Public Works Department, Bombay, has kindly supplied some valuable information regarding discharges from certain catchment areas. The observed flood discharges of three rivers in Khandeish give coefficients in Dickens' formula of 1,228 to 1,852 and in Ryves' formula 2,310 to 3,230. In the case which gives the highest coefficient (the Panjra river) the run-off was at the rate of ·54 inch per hour from 788 square miles although the maximum width of the catchment is only 21 miles. The Bhatghir reservoir has a long narrow catchment of 128 square miles. The heaviest observed flood gave a discharge of 27,130 inclusive of 8,130 cubic feet per second added to contents of lake. Lake Fife is perhaps the case most in point. Its drainage area is 196 square miles and average rainfall about the same (95 inches) as the supposed rainfall of the Periyár catchment. The proportions between the width and length of the basins and between the lake area and catchment area are also nearly the same. The highest observed flood occurred on 28th to 30th July 1896. The observations which were made hour by hour while the flood was rising from 28th July 9 P.M. to 29th July 9½ P.M. admit of calculations being made which are of much greater value than the rough estimates of a river discharge. The total run-off in the 24½ hours was 11·86 inches, of which 1·24 were added to the contents of the lake. The maximum rate of run-off was 75,207 cubic feet per second discharge and 32,222 added to lake or a total of 107,429 cubic feet per second. This gives a coefficient in Dickens' formula of 2,050 which is nearly the same as calculated for the Periyár; a maximum rate of run-off ·85 inch per hour and a rate not much lower than this for the last 4½ hours of the observations.

All the information recently obtained certainly seems to confirm the inference stated in paragraph 8 of my previous note that a flood of the magnitude recorded in the blue book is not only possible, but probable, and that in taking it as a maximum for purposes of calculation a margin should be allowed for error. The Periyár lake is about 50 miles from the west and 80 miles from the East Coast, and if, as is probable, rainfall is not so intense, in country of the same physical characteristics, remote from the coast as near it, it may be safe to take the reputed discharge of the 1869 flood as something near a maximum.

In calculating the discharging capacity of the Periyár escape the formula for discharge over a broad crested weir has been used for obtaining the discharge for given depths at the lower end where the water falls into a deep chasm. [illegible] charges so obtained are used with Kutter's formula to get the surface fall [illegible] escape channel assuming its bed to be level. The fall arrived at in [illegible]

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practically the same for all depths, and amounts to ·7 feet. The results are given in margin.

Depth at lower end of escape.	Depth at lake end of escape.	Discharge.
4	4·75	9,630
6	6·74	18,300
8	8·71	28,300
10	10·71	40,230
12	12·71	53,820
14	14·70	70,330

The lowering of the channel any given depth would lower the flood level given in my previous calculations by somewhat less than that depth. It would be useless to go into minute calculations on such uncertain data. The Inspector-General proposed to cut down the escape one or two feet and fit falling shutters. The estimate prepared provides for cutting down the channel 3 feet, but as shutters of this height could not be worked without great loss of water since they could not be raised until water had fallen $1\frac{1}{2}$ or 2 feet below full lake level, it is proposed to build a weir across the channel. The effect of this will be to raise the water level about a foot when there is 12 to 15 feet in rear of the dam. With 14 feet at lower end of escape the level in lake would be $12\frac{3}{4}$ feet above crest of weir or $1\frac{1}{4}$ feet below top of parapets. It could not rise above this in a flood like that of 1869 and as the discharge increases rapidly with increase of depth the margin of $1\frac{1}{4}$ feet before water begins to pass over the dam parapets seems sufficient. This method of dealing with the matter is much more effective than removing the parapets of the dam, and I recommend that it be adopted expensive though it be. There is no need to cut down the channel bed in front of the weir to 141. It will be sufficient to lower it to 142·0 or 2 feet below the weir crest. The weir is designed to be as near the lake as practicable without getting on the sloping part of the rock.

OOTACAMUND,
28th June 1898.

(Signed) W. HUGHES,
Chief Engineer for Irrigation.

Enclosures to above Note.

1 Detailed and abstract estimate, Rs. 45,900.
1 Specification.
1 Detailed and abstract estimate, Rs. 5,700.
1 Sheet of cross sections right bank escape, dated 31st March 1898.
2 Sheets of cross sections right bank escape, dated 25th May 1898.
1 Survey of right bank escape, dated 25th May 1898.
1 Diagram of calculation of flood discharges of Lake Fife, Bombay.

ORDER—No. 584 I., dated 29th July 1898.

1. Lowering the bed of the Periyár escape channel and constructing a weir 150 feet on lake side of present weir—

	RS.
I. Works	45,900
II. Establishment	10,557
III. Tools and plant	43
Total estimate ..	56,500

2. Lowering the parapet of the Periyár main dam and providing rails—

	RS.
I. Works	5,700
II. Establishment	1,311
III. Tools and plant	89
Total estimate ..	7,100

Ordered that a copy of these Proceedings, together with the estimates for the works marginally noted, be forwarded for the consideration and orders of the Government of India with reference to its letter, No. 325 I., dated 28th December 1897.

[Here enter No. 585 I., dated 29th July 1898.]

(True Extract.)

(Signed) J. C. LARMINIE,
Ag. Joint Secy. to Government,
Irrigation Branch.

To the Chief Engineer for Irrigation.
" Superintending Engineer, VI Circle.
" Examiner, Public Works Accounts.

ENDORSEMENT—No. 585 I., dated 29th July 1898.

Forwarded.

(By order.)

(Signed) J. C. LARMINIE,
Ag. Joint Secy. to Government,
Irrigation Branch.

Exd. C. M. Thmbusawmy.

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Estimate for lowering the bed of the Periyar Escape channel.

Urgent

PUBLIC WORKS DEPARTMENT,

IRRIGATION BRANCH.

Flag G.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

Letter from Chief Engr. P.W.D. Bombay No. C.E. 5 d. 20 Jan. 98
Do. do. do. with enclosures — No. 27 C.E. d. 26 May 98

UNDER date the

READ the following

Note by the Chief Engr. for Irrigation No. 193 I d. 28.6.98

Print & Issue immediately. Flag H.

W.H.

57.98

The recommendation of the Chief Engr. for Irrigation in the concluding paragraph of the foregoing note is approved. No. 584 I d/29.7.98

Ordered that a copy of these Procs: together with the estimates for the works marginally noted be forwarded for the consideration & orders of the Govt. of India with reference to its letter No. 325 I, d 28 Dec/97.

A.S.H.
4.7.98

1. Lowering the bed of the Periyar Escape channel & constructing a weir 150 ft on lakeside of present weir —

	Rs
I. Works . . .	45,900
II. Establishment.	10,557
III. Tools & Plant.	43
Total Estimate	56,500

2. Lowering the parapet of the Periyar Main Dam & providing rails —

I. Works . . .	5700
II. Establishment.	1311
III. Tools & Plant.	89
Total Estimate	7100

Endorsement No. 585 I d/29.7

Forwarded.

Flag F.

28/6/98

12/8/98 W.H.

28.6.98

Engr. for I.
Engr. 12
I W.

13/8/98 into diagram & calculation of flood discharge of lake [illegible] Bombay

Urgent

584-585
8

8

Public Works (1898) Department.

CURRENT No. 5774

5774
5775
5791

From the Chief Engr for Irrgn

Order

No. 193 I

Dated 28-6-98

Received } 11-7-98
Registered }

Enclosures 8 14 (5 plans)

Spare copies

SUBJECT.

Renewing the parapet of the Periyar Main Dam and for lowering the level of escape — Note submg the estimates for — Called for by the Govt of India

Tracing from the Topographical Sheets showing Catchment Basin of Lake Fife & Bhatgha.

The positions of observing stations is marked by a circle in red.

Tracing from the Topographical Sheets showing Catchment Basins of Lake Fife & Bhatgha.

The positions of observing stations is marked by a circle in red.

Torka
RAJGARH
Rajghr
Bhatgarh

584-585
10

No. 19.

Note by the Chief Engineer for Irrigation

The estimates called for in the Government

+Flag H — of India letter No. 325 I. dated 28th December 1897

removing part of the parapets of the [illegible] [illegible]

and for lowering the level of the escape are herewith

+Flag E — submitted. Since the note printed with G. O. No. 99

dated 10th November 1897 was written the Chief

Engineer, P. W. D., Bombay, has kindly supplied

some valuable information regarding discharges from

certain catchment areas. The observed floods [illegible]

of three rivers in Khandeish give coefficients in

Dicken's formula of 1228 to 1852 and in Ryves'

formula 2,310 to 3,230. In the case which gives

the highest coefficient (the Panjra River) the

run off was at the rate of ·54 inch per hour

from 788 square miles although the maximum

width of the catchment is only 21 miles. The

Bhatghur Reservoir has a long narrow catchment

of 128 square miles. The heaviest observed flood

gave a discharge of 27,130 inclusive of 8130 cubic feet

per second added to contents of lake. Lake

Fife is perhaps the case most in p[illegible]

drainage area is 196 square miles and

... amount the (5 inches) as the supposed
fall of the Periyar catchment. The proportions
between the width and length of the basins and
between the lake area and catchment area are also
nearly the same. The highest observed flood occurred
28 to 30 July 1896. The observations which were
made hour by hour while the flood was rising
from 28th July 9 P.M. to 29th July 9½ P.M. admit of
calculations being made which are of much greater
value than the rough estimate of a river discharge.
The total run off in the 24 hours was 11.86
inches of which 1.24 was added to the contents
of the lake. The maximum rate of run off was
... cubic feet per second discharge and 72212
added to lake or a total of 107429 cub. feet per
second. This gives a coefficient in Dicken's formula
of ... which is nearly the same as calculated
for the Periyar; a maximum rate of run-off .85 inch
per hour and a rate not much lower than
this for the last 4½ hours of the observations.
All the information recently obtained
certainly seems to confirm the inference stated
in para 8 of my previous note that a flood
of the magnitude recorded in the blue book is

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11

not only possi[illegible] [illegible]robable, and that in
it as a maximum for purposes of calculation a
margin should be allowed for error. The Periyar
Lake is about 50 miles from the west and 80 miles
from the East coast, and if, as is probable, rainfal[l]
[n]ot so intense, in country of the same physical
characteristics, remote from the coast as near it,
it may be safe to take the reputed discharge of
the 1869 flood as something near a maximum.

In calculating the discharging capacity
of the Periyar escape the formula for discharge over a
broad crested weir has been used for obtaining
the discharge for given depths at the lower end
where the water falls into a deep chasm. The
discharges so obtained are used with Kutter's formu[la]
to get the surface fall through the escape channel
assuming its bed to be level. The fall arrived at
in this way is practically the same for all depths
and amounts to .7 feet. The results are given
in margin. The lowering of the channel any
given depth would lower the flood level
given in my previous calculations by
somewhat less than that depth. It
would be useless to go into minute
calculations on such uncertain dat[a]

Depth at lower end of Escape	Depth at lake end of Escape	Discharge
4	4.75	9630
6	6.74	18300
8	8.71	28300
[illegible]0	10.71	40230
[illegible]	12.71	53820
[illegible]	14.7[illegible]	[illegible]

Inspector Genera[l] … down the
escape one or two feet and fit falling shutters
~~but this does not now appear to be sufficient.~~
The estimate prepared provides for cutting down
the channel 3 feet but as shutters of this
height could not be worked without great
of water since they could not be raised until
water had fallen $1\frac{1}{2}$ or 2 feet below full lake
level, it is proposed to build a weir across
the channel. The effect of this will be to raise
the water level about a foot when there is
15 ft feet in rear of the dam, ~~three quarter foot with~~
~~feet in rear and perhaps one half foot with 16 feet.~~
With 14 feet at lower end of escape the level in
lake would be ~~$12\frac{1}{2}$~~ $12\frac{3}{4}$ feet above crest of ~~dam~~ weir or $1\frac{1}{4}$ feet
below top of parapets. It could not rise above
this in a flood like that of 1869 and as the
discharge increases rapidly with increase of depth
the margin of $1\frac{1}{4}$ feet before water begins to pass over
the dam parapets seems sufficient. This method of
dealing with the matter is much more effective
than removing the parapets of the dam and I
recommend that it be adopted expensive though
it be. There is no need to cut down the channel
bed in front of the weir to 141. It will be—

12

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12

Sufficient lower it to 142.0 or 2 feet below the weir crest. The weir is designed to be as near the lake as practicable without getting on the sloping part of the rock.

W. H.

Ootacamund } Chief Engineer for Irrigat
28 June 1898 }

To

The Joint Secretary to Government
P. W. D. Irrigation Br

Enclosures to above Note
1 Detailed and abstract estimate Rs 45,900
1 Specification
1 Detailed & abstract estimate 5700
1 Sheet of cross sections Right bank escape d/ 31-3-98
2 Sheets of cross sections Right bank escape d/ 25-5-98
1 Survey of Right bank escape d/ 25-5-98
1 Diagram of calculation of flood discharge of Lake Fife Bomba

13

584585/13

Public Works (1898) Department.

CURRENT No. ~~248 PD~~ 5791

From the Chief Engineer P.W.D. Bombay

Order

No. 27. C.E.

Dated 26th May '98

Received } 11.7.98

Registered } ~~15 - 6 - 98~~

Enclosures 1

Spare copies

SUBJECT.

Lake Fife and Bhatgar reservoir - forwarding copy of a letter from the Exe Engr. Poona furnishing the additional information regd. in connection

No.	Date.		No.	Date.
949 M	4/10·2·98		1196 M	12 6 98

584585 / 14 14

11 SP

No 2200 of 1898

Executive Engineer's Office

Poona, 6th May 1898

From

The Executive Engineer for Irrigation,

Poona District

To

The Superintending Engineer,

Central Division, Poona

Sir

With reference to your No. 1127 of 28 ultimo forwarding Government Memo: No. 118 I of 22nd idem, I have the honour to report as follows:-

— Lake Fife —

Date 29 July

Time	R.L. of water	area	content
8 P.M.	249.67	164,816,876	9083669
9 P.M.	250.22	165,498,359	
9-30 P.M.	250.57	165,932,030	5800030

Waste weir clear overfall } Length 513 ft R.L. 243.07
Length 716 ft — 244.07

Discharge over Waste weir at 8 P.M.

(Period 8 to 9 P.M.) (C.P.T.O.)

Lower $= 3.488 \times 513 \times 6.6\sqrt{6.6} = 30351$ cft per second

Higher $= 3.488 \times 716 \times 5.6\sqrt{5.6} = 30593$

Total discharge at 8 P.M. = 60944

Discharge at 9 P.M.

Lower = 3·488 × 513 × 7·15 $\sqrt{7 \cdot 15}$ = 34159
Higher = 3·488 × 716 × 6·15 $\sqrt{6 \cdot 15}$ = 38090

Total discharge at 9 P.M. = 72,249

Mean discharge during hour $\frac{60944 + 72249}{2}$ = 66596
Replenishment in Tank = $\frac{90836690}{3600}$ cft = 25232

Flood in cft per second = 91828

Discharge over weir at 9 P.M. = 72249 cft. per second

Discharge at 9-30 P.M.

Lower = 3·488 × 513 × 7·5 $\sqrt{7 \cdot 5}$ = 36771
Higher = 3·488 × 716 × 6·5 $\sqrt{6 \cdot 5}$ = 41394

Total discharge at 9-30 P.M. = 78165

Mean of period $\frac{72249 + 78165}{2}$ = 75207 cft per second

Replenishment in Tank
= $\frac{58000301}{1800}$ = 32222

Total Flood 107429 cft per second.

I should however state that the actual time at which the highest flood occurred is not exactly known. The float of the automatic gauge was washed away soon after 9 o'clock and the exact level of the water at that time is difficult to ascertain as the line traced is very erratic but it is approximately what I have stated. In the original report on the flood the time at which the maximum height was reached is

15

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15

stated to have been 9-30 P.m. and the maximum height itself was ascertained the following morning to have been 250.57'. The automatic gauge shows that the intensity of the flood was less during other hours of the day.

The gaugings of the lake and area are as follows:-

Injayawadmp

43.07
4.07
4.50
5.0
5.53
5.90
6.11
6.50
6.86
7.00
7.0
6.80
6.53
6.18
5.85
5.60
5.48
5.47
5.35
5.70

Date	Time	R.L	Area
July 28	9 P.m.	47.14	161682047
" "	10 P.m.	47.57	162214845
" "	11 P.m.	48.07	162834376
" "	12 —	48.60	163491097
" 29	1 A.M	48.97	163949533
" "	4 A.M	49.18	164209736
" "	5 A.M	49.57	164692971
" "	6 —	49.87	165064689
" "	7 —	50.07	165312500
" "	8-20	50.07	165312500
" "	9 —	49.87	165064689
" "	10 —	49.60	164730142
" "	10 A.M	49.60	164730142
" "	11 A.M	49.25	164296470
" "	12 noon	48.92	163887590
" "	1 P.m.	48.67	163577814
" "	2 "	48.55	163429106
" "	3 "	48.54	163416797
" "	4 "	48.62	163515861
" "	5 "	48.77	163701730
		[illegible]	163974314

Date	Time	R.L.	Area	
July 29	7 P.M.	49.29	164346032	6.22
" "	8 P.M.	49.67	164816876	6.60
" "	9 P.M.	50.17	165436406	7.10
" "	9-30	50.57 (probable)	165932030	7.50
Gauge displaced				
" 30	12 noon	48.03	162784813	4.96
" "	1 P.M.	47.76	162450266	4.69

2 With regard to the flood in Bhat-ghar Lake it is not possible to go into the same detail owing to the less number of gaugings taken. The actual gaugings of the tank show the following -

Date	Time	R.L.	Contents millions cft.	Increase in contents during period millions cft.	Length of period	Increase in Tank per second
July 28	6 P.M.	46.8	687.2	569.6	24 hours	6600
" 29	-Do-	54.5	1256.8	702.3	24 -Do-	8130
" 30	-Do-	61.6	1959.1	128.7	24 Do-	1490
" 31	-Do-	62.8	2087.8	245.8	12 -Do-	5690
1 August	6 AM	64.5	2333.6	"	"	"

16

544/585
16

During these periods the whole of the undersluices each 8'×4' were open. The discharge on 30th when the level stood at 61·6 would be:-

$D = AV \qquad V = C\sqrt{2gh} \qquad C = 0{\cdot}65$

$D = 15 \times 8 \times 4 \times 0{\cdot}65 \quad \sqrt{64{\cdot}4 \times (61 - 3{\cdot}4)}$

$= 312\sqrt{64{\cdot}4 \times 57{\cdot}6} = 312\sqrt{3709{\cdot}4}$

$= 312 \times 60{\cdot}9 = 19000$ cft per second.

Add the average increase in tank during the period the total becomes 19000 + 8130 = 27130 cft per second representing a run-off of 0·33 inches per hour from the catchment of 128 square miles. The discharge on 1st when the level stood at 64·5 would be:-

$D = 312\sqrt{64{\cdot}4 \times (64{\cdot}5 - 4)} = 312\sqrt{64{\cdot}4 \times 60{\cdot}5}$

$= 312\sqrt{3896{\cdot}2} = 312 \times 62{\cdot}4 = 19469$ cft per second.

Add the average increase in tank during the period the total becomes 19469 + 5690 = 25159 cft per second or a run off of 0·30 inch per hour from the catchment of 128 square miles.

I have &c

(Signed) F. L. Sprott C.E.
Ex. Engr. for Irrgn Poona District

True Copy
J D Kolatkar
Asst. Assistant Secry to Govt.

17

584-585
17

No 27 C.E. of 1898
Public Works Department
Mahabaleshwar 26th May 98

10 P

To

W. Hughes Esquire, B.A.
Chief Engineer for
Irrigation, Madras

Sir,

I have the honor to acknowledge receipt of your letter No 49 M. dated 10th February 1898, and in compliance with the request therein made to forward copy of a letter from the Executive Engineer for Irrigation Poona District furnishing the additional information required in connection with the

~~Total discharge of Lake - 28th July 9 pm to 29th July 9½ pm~~
~~= 4835, 484.000 cft.~~
~~Increase in Contents 561, 858, 140~~
~~5397, 342, 140~~
~~Area of Catchment~~
~~196 × 27878400~~
~~= 5464, 166, 400~~
~~Run off in 24½ hours~~
~~= 5397, 342, 140 / 5464, 166, 400~~
~~= .988 ft~~
~~= 11.855 inches~~

Lake Fife and Bhatghar
Reservoir.

I have the honor to be
Sir,
Your most obedt. Servant
[illegible]
M. Inst C.E.
Chief Engineer P.W.D.

584-85
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R no. 248m
× .6.98

584-585
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Public Works (1898) Department.

CURRENT No. ~~29 M~~ 5775

Order

From the Chief Engineer P. W. D. Bombay

No. C.E. 5 of 98

Dated 20 Jany 98

Received ~~24~~ 11-7-98

Enclosures ~~2~~ (plans)

Spare copies

SUBJECT.

Information in connection with the Lake Tipe Bhatgar reservoir & Tansa Lake together with a tracing — forwarding certain correspondence furnishing also a copy of [illegible] in some of the reservoirs in Nasik Dist. & stating that the works of Maladevi and Newri tanks have not yet been

To E1
[illegible] 31/1/98
File [illegible]
Put up Inspector [illegible] [illegible] about [illegible] & Govt of India reply [illegible]
[illegible] 28/1/98
Put up [illegible]
[illegible] 28/1/98

584-585
20

Storm in November while the gre[ater]
floods have occured in July.
A run off of 1" per hour from [the]
whole catchment gives a flood [of]
126,585 cft. per second so that th[e]
maximum observed flood is equ[al]
to a run off of 0.84 inche[s] pe[r]
hour, while the estimated run off
is practically $\frac{1}{2}$" per hour. The
intensity of this flood, which is gr[eat]
is due to the nearness of the la[ke]
to the Western Ghauts the catchm[ent]
running out to the water-shed.
The basin of the lake is entirely s[ur]-
rounded by high hills partly cover[ed]
with jungle and includes only a
small area of cultivated ground
The sides of the hill are steep. The
basin runs nearly due East and
West the dam being at the Eastern
end. The lake is fed almost en-
tirely from the South West Monsoon
rains.

Information regarding Bhatghar
Reservoi[r]

... has been asked for from
...orres Assistant Engineer and
be forwarded on receipt

I have the honour to be

Sir

your most obedient Servant

(Signed) F. S. Sprott C. E.

Executive Engr for Irrgn.

P. D.

CHIEF ENGINEER
FOR IRRIGATION.
24 JAN. 1898
No. 29 m/5

584-585
21

2)

No 6246 of 1897

Executive Engineer's Offi[ce]

Camp Wadgaon 6/13 December

From

The Executive Engineer for
Irrigation, Poona Di[strict]

To

The Superintending Engineer, Centra[l]
Division, Poona

Sir

In continuation of this office No
5323 dated 12th October 1897, I have the
honor to forward the following informat[ion]
regarding Bhatghar Tank

(1) Catchment area ———— 128 Sqr miles

(2) Estimated rainfall ———— 145 inches,
being the mean between 40 inches
at Bhatghar and 250 inches on the Ghats

(3) The average and maximum rainfall
of the various reporting Stations is
as below:—

Area at FTL 156 msft

Catchmen 1087 ft

D = 670 mill cu

		average	max 24 h[ours]
Bhatghar Bungalow	(15 years)	43.44	4.25
— Do — village	(17 years)	44.62	3.65
Pasora	(1 year)	56.40	no Record
Rajghar	Do	46.48	5.75
Inala	Do	105.36	7.20
Bopa	Do	203.93	7.80
Torna	Do	134.84	5.65

tracing showing observing stations is
ttached

maximum observed flood occured on
th July 1896. All lower sluices, 15 in number
ch 8 x 4 were open. The water level
ached 64.50 ft in the lake. The flood
s at the rate of 25,500 cft per second.
is is at the rate of .3096 inches per hours.

There is no record of the maximum
uantity run off in 24 hours.

) The basin of the lake is entirely
urrounded by high hills partly covered
ith jungle and includes only a small
rea of cultivated ground. The sides
f the hill are steep. The basin runs
early East & west, the dam being at
he eastern end. The lake is fed almost
entirely from the S.W. monsoon rain.

I have the honor to be
Sir
your most obedient servant
Sd/ F. L. Sprott C.E.
Ex. Engr. for Irrgn. P.D.

25500
60
1530000
60
91800000

CHIEF ENGINEER
FOR IRRIGATION.
24 JAN. 1898
No. 29 Iri/4

08/5445
4.5.90

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Notes of flood in Bombay Presidency

2 Floods

The following are records of large floods in Khandesh, Bombay Presidency. The upper Panjhra River, has at the site of the Datarti weir, a catchment of 265 sq miles. Its average width is 8 miles on the N. S and W. it is bounded by trap hills with steep uncultivated slopes, the valley between being flat and cultivated. The rainfall gauged was:

Date	Rain gauge stations				
	Anti	Dahiwad	Pimpalner	Sakri	Lakkhata
September 1882					
7	.....	2.03	0.12	0.29	1.35 (7–8)
8	9.71	0.29	0.00	0.00	
9	.....	1.31	1.92	1.54	2.30 (9–10)
10	.....	4.03	4.02	2.67	
11	5.31 (11–13)	4.31	4.11	3.33	
12		.....			2.30 (12–13)
13					
	15.02	11.97	10.17	7.83	5.95

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At the Stations where two or more days' falls are bracketted, daily observations were not made

The flood as calculated from the high flood marks, amounted to 49,700 cft per Second or to a run off of 0.297 inch per hour. During the same time the neighbouring Burai River at Ranniálá with a catchment of 65 sqr. miles, which is practically uncultivated and is elevated, with hills on the N.S and W had a flood similarly calculated, of 37,800 cft per second equal to a run off of 0.90 inch per hour. There were no rain gauge stations in this area.

At the Jamda weir Girna River on September 15th 1872, the flood rose to 6.45 ft on the weir crest and was calculated to amount to 373,000 cft per Second. The catchment area is about 2050 sqr miles, extending from the ghauts, where it is 30 miles wide, hilly and uncultivated, to the weir site where it is flat and cultivated.

This

584-585 / 23

23

This gives a run off of 0.28 inch per hour. At the same place on 11th September 1882 there was another severe flood rising to 15.90 ft on the weir crest, but, as it ~~is~~ out flanked the work and broke into a tributary valley damaging the canal, and could not be gauged at the weir site, it was probably as large as the previous one. The rainfall gauged on this latter occasion on September 9th, 10th and 11th was:-

	Ghauts		upper basin		Lower Basin			
Station	Igatgad	Aliabad	Chanpa pur	Kalwan	Nandgaon	Malegaon	Sargaon	Jamda
miles above weir	97	82	81	71	34	16	38	2
Inches of rainfall	22.80	56.59	12.21	14.42	8.15	5.83	9.35	3.35

At Mahilla, near Dhulia the Panjra River on the 15th Septr 1872 had a flood discharge of 276,000 cft per second, equal to a run off of 0.54 inch per hour on a catchment of 788 sqr miles. The River rises in the Western Ghauts; at its source the catchment has its maximum

=1852 M³

=3230 R³

maximum width of 21 miles is
[e]levated and bounded by steep un-
[c]ultivated hills. Uncultivated trap
hills bound the whole valley but lower
down it is itself flat and cultivated
The rainfall gauged was:—

CHIEF ENGINEER
FOR IRRIGATION.
24 JAN. 1898
No. 29 m/3

	Distance from Gauge Station	September					Total.
		11	12	13	14	15	
[P]impalner	45 miles	2·13	0·20	---	9·90	0·60	12·83
Dhulia	1 mile	---	0·34	—	5·69	0·36	6·39

The flood commenced to rise at 8 P.M
on the 14th, obtained its maximum at
6-30 A.M on the 15th and returned to
its original dimension on the morning
of the 16th

Sd/ W. L. Strange
Executive Engineer
Nasik District

5775/85
OLE 5

2X 584-585/24

No D/128 of 1897

Camp Nandgaon 22nd December
1897

To

The Secretary to Government
Public Works Department
Bombay

Memorandum

With reference to Government memo: No 725 I dated 16th September last, forwarding copy of a letter from the Chief Engineer for Irrigation Ootacamund, has the honour to forward copies of Nos 532 dated 12th October last and 6246 dated 6/13 Instant from the Executive Engineer for Irrigation Poona, giving the information asked for, for Lake Fife and Bhatghar Tank, respectively, also copy of notes on Floods in some of the Rivers in the Nasik District supplied by the Executive Engineer which may be found of interest. A tracing also accompanies showing the catchment and gauge stations of

Lake Fife and Bhatghar Tank

(Signed)

S. Rebsch M.I.C.E.

Superintending Engineer C. Dn

CHIEF ENGINEER
FOR IRRIGATION.
24 JAN. 1898
No. 20 M / 2

"True Copies"

J. D. Kolatkar
Assistant Secretary to Govt.

E.M.

P.S./5775
9 .970

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2 8

No 9686 of 1897-98

Bombay 15th october 1897

To

The Municipal Commissioner

Sir,

I have the honour to report that hourly observations of the rainfall are not made at Tansa but only twelve hourly and daily rainfalls are registered.

2 I beg to submit a statement showing the heaviest rainfall at Tansa during the last four years.

3 The Tansa catchment area measures nearly 52 sq miles and is surrounded by ranges of high hills both on the north and south gradually sloping towards the east.

4 The masonry dam built across the valley to a length of over 9,000 feet, almost faces the direction of the storm.

5 The hills are thickly covered with teak, Dhavra and other trees which form the Tansa forest.

6 Rice and nachni are cultivated over a limited portion of the high ground but grass grows over a large tract of the land.

CHIEF ENGINEER FOR IRRIGATION
24 JAN. 1898
No. 29 ru / 6

I have the honor to be

Sir

your most obedient servant

(Signed) M. C. Murzban

Executive Engineer.

No 18034 of 16-10-97

Copy forwarded with compliments to the Secretary to Government P. W. Departt with reference to his no. 726 I of 16th September last

(Signed) J. H. DuBoulay

Dy. Municipal Commissioner

for the city of Bombay

53/5575
1-1-1890

3 B 2[illegible]

584-585
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Date & month	Time of taking observations	12 Hour's rainfall	24 hours rainfall	
12th July 1894	6 P.M.	1· 95		
	6 A.M.	3· 86	5· 81	
19th July 1894	6 A.M.	1· 07		
	6 P.M.	6· 25	7· 32	24·54 inches in three Continuous days.
20th July 1894	6 P.M.	5· 63		
	6·a·m·	3· 93	9· 56	
21st July 1894	6 P.M.	3· 73		
	6·A·m·	3· 93	7· 66	
20th June 1895	6 P.M.	4· 14		
	6·a·m·	1· 20	5· 34	
17th July 1895	6 P.M	2· 90		
	6 A.M	1· 25	4· 15	
7th August 95	6 P.M.	3· 79		
	6 A.M.	·· 55	4· 34	
7th Septr 1895	6 P.M.	1· 50		
	6 A.M.	2· 62	4· 12	
21st June 1896	6 P.M.	1· 62		
	6 A.M.	3· 50	5· 12	
22nd June 1896	6 P.M.	2· 80		
	6 A.M.	1· 40	4· 20·	

Date & month	Time of taking observation	12 hours rainfall	24 hours rainfall	
24th July 1896	6 P.M.	3.40		
	6 A.M.	4.71	8.11	
25th July 1896	6 P.M.	3.54		
	6 A.M.	1.84	5.39	
28th July 1896	6 P.M.	.40		
	6. A.M.	6.20	6.60	20.65 Inches rainfall in three days.
29th July 1896	6 P.M.	4.45		
	6 A.M.	3.85	8.30	
30th July 1896	6 P.M.	.75		
	6 a.m.	5...	5.75	
10th August 1896	6 P.M.	2.70		
	6 a.m.	2.45	5.15	
15th July 1897	6 P.M.	3.30		
	6 A.M.	1.80	5.10	
7th August 97	6 P.M.	5.15		
	6 A.M.	2.80	7.95	
8th August 97	6 P.M.	2.25		
	6 A.M.	2...	4.25	

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No 5323 of 1897

Poona, 12th October 1897

From

The Executive for Irrigation
Poona District

To

The Superintending Engineer, C. Dn

Sir

With reference to G. M. 725 I dated 16th ultimo forwarded under your No 6905 dated 21st idem, I have the honor to report as follows:—

Lake Fife

Area at FTL 1540 mcft (1) Catchment area 196 Sqr miles

[illegible] 1369 " (2) Estimated Rainfall - Information not available

(3) Estimated discharging capacity of the W. weir ——— 62,000 cft per second

4 Average rainfall at Kharakwasla for the last 20 years ——— 31·21 inches

5 Maximum observed rainfall in 24 hours ——— 4·34 inches

= 2024 × 196¾ (6) Maximum observed flood — 106,083 cft per second

7 Maximum run off in any 24 hours } Information not available

With regard to (4) I would however point out that the figures given are those taken from the gauge at Kharakwasla, which is at the dam end of the Lake. Figures of rainfall during the 2 years 1878 & 79 at 8 places in the catchment area are available. These two years were, at Kharakwasla, years of slightly over the average fall. The figures are as below:-

	average	maximum
Athkarwadi	49·69	2·72
Singhur Hill	57·47	2·94
Ambegaon	84·67	4·50
Musa	108·53	6·85
Wejra	217·29	8·60
Dupsura	145·10	8·15
Mutha	58·14	3·68
Bamboa	37·39	3·45
	8) 758·28	
	94·78	

It is this rainfall that is instrumental in filling the lake and not that gauged at Kharakwasla.

The maximum gauged at Kharak-wasla itself occurred during a

No. C.E. 5 of 1898

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Public Works Department
Bombay Castle, 20th January/98

To

W. Hughes Esquire B.A.
Chief Engineer for Irrigation
Madras.

Sir,

I have the honor to acknowledge receipt of your letter dated the 27th August 1897, and in compliance with the request therein made, to forward copies of letters from local officers furnishing the requisite information in connection with the Lake Fife, Bhatghar Reservoir and Tansa Lake, together with a tracing[x] showing the catchment and gauge stations of the two former lakes. I also enclose a copy of Notes on floods in some of the rivers in the Nasik District supplied

[x] To be returned please.

by

by the Executive Engineer of that District which may afford useful data. The remaining two works, viz Maladevi and Newri tanks mentioned in the margin of para: 2 of your letter under reply have not yet been constructed.

I have the honor to be,

Sir,

Your most obedient Servant.

H. Mc Humphrey B. A., M. Inst C.E.

Chief Engineer P. W. Departt

C.P.

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CHIEF ENGINEER
FOR IRRIGATION.
24 JAN. 1898
No. 29 M.